ABSTRACT OF THE DISCLOSURE

An indirectly heated button cathode for use in the ion source of an ion implanter has a button member formed of a slug of tantalum mounted in a collar of tungsten. The lower thermionic work function of tantalum causes electron emission to be concentrated over the surface of a tantalum slug. The tantalum slug may be mounted to enable it to operate at a higher temperature compared to the surrounding tungsten collar portion. The resultant concentrated plasma in the ion source is effective to enhance the production of higher charge state ions, particularly P^{+++} for subsequent acceleration for high energy implantation.